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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/722,174

11/25/2003

MacKenzie King

ATMI-688

7009

23448

7590

08/06/2008

INTELLECTUAL PROPERTY / TECHNOLOGY LAW

PO BOX 14329

RESEARCH TRIANGLE PARK, NC 27709

EXAMINER

SMITH, NICHOLAS A

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

08/06/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/722,174	<b>Applicant(s)</b> KING ET AL.	
	<b>Examiner</b> NICHOLAS A. SMITH	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 May 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) 1-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 14-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>1/21/08</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9 May 2008 has been entered.

### **Status of Claims**

1. Claims 14-34 remain for examination. Claims 35-36 are new.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

a. A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 14-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andricacos et al. (US 5,352,350) as evidenced by dictionary.com, *Random House, Inc.* in view of Chung et al. (US 6,409,903).

4. In regards to claim 14, Andricacos et al. discloses an electrochemical deposition apparatus, a computation module constructed and arranged to perform a regression analysis, solving dependent variable equations and a control assembly capable of modulating copper electrochemical deposition (Figs. 2, 3A and 3B, example 2).

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Andricacos et al. is configured with a computation module capable of performing a regression analysis and specifically discloses utilizing a wafer-based independent variable, such as the time integral of the plating current (col. 6, lines 41-63).

5. Furthermore, In regards to claim(s) 14 “said computational module being adapted for coupling in signal processing, monitoring and control relationship with the electrochemical deposition system when said electrochemical deposition system is arranged with the wafer being plated constituting a cathode element of an electrochemical cell including said copper plating anode, and said computational module being arranged to process an electrode parameter of said wafer as said wafer-based independent variable in said regression analysis,” Andricacos teaches such a computational module adapted for coupling the claimed limitations as stated above (Fig. 2 and col. 6, lines 41-63) Andricacos et al. discloses plating current is an electrode parameter of said wafer-based independent variable and thus meets the claimed limitation (col. 6, lines 41-63).

6. In further regards to claim 14, Applicant argues that Andricacos et al. does not perform regression analysis. Applicant is directed to the follow definition of regression analysis from dictionary.com:

“regression analysis

—noun

*Statistics.* a procedure for determining a relationship between a dependent variable, as predicted success in college, and an independent variable, as a score on a scholastic aptitude test, for a given population. The relationship is expressed as an equation for a line (regres·sion·line·) or curve (regres·sion·curve·) in which any coefficient (regression coefficient) of the independent variable in the equation has been determined from a sample population.

“

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Applicant is reminded that Andricacos et al. does determine a parameter (regression coefficient) and models at least the stoichiometric coefficient ( $\Delta k_i$ ) based off of concentration change ( $\Delta c_i$ ) and cumulative plating ( $\Delta s$ ). The sample population is the data used to collect  $\Delta s$  and  $\Delta c_i$ , the regression coefficient is at least  $\Delta k_i$ , which is determined from the sample population, and is expressed as at least an equation for a line,  $\Delta c_i = \Delta k_i \Delta s$ , therefore meeting the definition of regression analysis.

7. In regards to claim(s) 14 limitation “wherein the apparatus is constructed and arranged so that the wafer being plated is a monitoring electrode in the monitoring conducted by the computational module, and wherein the computational module is adapted for coupling in signal transmission relationship with the wafer,” and claim 32, Andricacos et al. discloses there is a monitoring electrode in the monitoring conducted by the computational module in that Andicacos et al. monitors and computationally handles the time integral of the plating current (col. 6, lines 41-63). Furthermore, the computation module is adapted for coupling in signal transmission relationship with an electrode since the integral of the plating current is the signal between the counter-electrode and the plating-electrode.

8. However, Andricacos et al. does not specifically disclose a wafer as an electrode component of an electrochemical cell.

9. Chung et al. discloses a wafer as an electrode component of an electrochemical cell include contacts and a seed layer (col. 4, line 62 to col. 5, line 8). It would have been obvious to one of ordinary skill in the art to modify Andricacos et al. apparatus with

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Chung et al.'s wafer as an electrode component in order to plate copper on the wafer (Chung et al., col. 5, lines 9-12).

10. In regards to claim 15, Andricacos et al. discloses a wafer-based independent variable, such as plating current (col. 6, lines 41-53).

11. In regards to claim 16-21, Andricacos et al. discloses a typical bath composition found in copper electroplating, including many of the claimed elements (Example 2).

However, an apparatus is not distinguished from the prior art by which bath composition is used bath, as long as prior art apparatus is capable of holding such a composition.

See MPEP 2114. In the instant case, Andricacos et al. discloses a plating cell capable of contained the electrolyte in the claimed composition.

12. In regards to claim 22-26, Andricacos et al. discloses a dependent variable as at least one component of electrochemical deposition medium, including specific additives (abstract, Fig. 2, and Example 2). Furthermore, Andricacos et al.'s apparatus is capable of employing the claimed additives as dependent variables.

13. In regards to claim 27-30, Andricacos et al. does not specifically disclose a control assembly comprising variable output power. However, such a variable out power supply would be inherently present in an electrochemical plating cell in order to function and would have to be able to vary between off and on modes to control the process. Andricacos et al. disclose at least three variable flow controls capable of delivering the claimed additive components of electrochemical deposition medium (Fig. 2, col. 6, lines 41-53, Example 2).

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14. In regards to claims 31, Andricacos et al. discloses an electrochemical deposition system to control copper electrochemical deposition therein (Example 2).

15. In regards to claims 33-34, Andricacos et al. discloses a dependent variable as such as plating current (col. 6, lines 41-53). Andricacos et al. in view of Chung et al. teaches that the wafer is electrically contacted and thus the plating current would be a wafer-based electrode parameter as claimed.

16. In regards to claim(s) 35, Andricacos et al. as evidenced by Dictionary.com and in view of Chung is applied to the claims for the same reasons as stated in paragraph(s) 4-9 and 15 above. It is noted that the whole system of Andricacos et al. shown in figure 2 meets the limitation of a metrology apparatus.

17. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Andricacos et al. as evidenced by dictionary.com, *Random House, Inc.* in view of Chung et al. and in further view of Horkans et al. (US 6592747 B2).

18. In regards to claim(s) 36, Andricacos et al. as evidenced by Dictionary.com and in view of Chung is applied to the claims for the same reasons as stated in paragraph(s) 4-9 and 15 above. It is further noted that Andricacos et al. uses regression analysis as stated above in paragraphs 5-6 to model additive concentrations, plating current, but does not explicitly disclose that the additives are accelerator, levelers and suppressors and does not explicitly disclose adaptation to monitor plating voltage or nucleation voltage.

19. Chung discloses an apparatus for plating capable of monitoring voltage of plating and also the beginning of the plating process, or nucleation voltage (abstract, col. 1, line

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46 to col. 3, line 15). It would have been obvious to one of ordinary skill in the art to modify Andricacos et al.'s apparatus to monitor voltage with respect to time and the nucleation voltage in order to avoid burn-through of the seed layer and have even plating (Chung, col. 3, line 44 to col. 4, line 15).

20. Horkans et al. discloses an electroplating apparatus wherein the accelerator, levelers and suppressors are controlled in a plating bath (col. 3, lines 30-55). It would have been obvious to one of ordinary skill in the art to modify Andricacos et al. as evidenced by Dictionary.com in view of Chung's apparatus with Horkans et al.'s specific type of copper plating bath additives because Horkans et al. teaches that such additives are desired to be controlled in order to reduce process complications (Horkans et al., col. 2, lines 30-55).

### ***Response to Arguments***

21. Applicant's arguments filed 9 May 2008 have been fully considered but they are not persuasive. In regards to Applicant's arguments that Andricacos et al. does not perform regression analysis, please see paragraphs 4-6 above in particular.

### ***Conclusion***

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICHOLAS A. SMITH whose telephone number is (571)272-8760. The examiner can normally be reached on 8:30 AM to 5:00 PM, Monday through Friday.

23. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on (571)-272-1293. The fax phone



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number for the organization where this application or proceeding is assigned is 571-273-8300.

24. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Harry D Wilkins, III/  
Primary Examiner, Art Unit 1795

NAS